

**Technical and Professional
Education**

**Curriculum Content Frameworks for
Human Anatomy & Physiology**

**Curriculum Content Frameworks for
Human Anatomy & Physiology
Developed by the
Department of Workforce Education**

**State of Arkansas
Department of Workforce Education**

NOTICE TO THE READER

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Preface

The Technical & Professional Education program continues to prepare students for employment and continuing education. To accomplish this preparation, teachers and employers have collaborated to modify individual programs to ensure that instruction is current and comprehensive. This document reflects essential competencies for program completers as well as all aspects of the health care industry as required by the Carl D. Perkins Act. The Curriculum Content Frameworks for all Technical & Professional Education programs can be accessed through the Department of Workforce Education Web site.

Foreword

The curriculum content framework Human Anatomy & Physiology supports the course that prepares students for the following career roles, which in turn correspond to the CIP (Classification of Instructional Programs) codes listed below. The courses may be sequenced with a variety of career and technical courses to form a specialization to prepare students for careers and support additional education and training in the protective services industry.

- Career Family: Technical & Professional Education
- Career Area: Medical Professions Education
- Career Role CIP Code: 51.202
- Human Anatomy & Physiology: 495300

Acknowledgments

The Human Anatomy & Physiology curriculum content framework was produced by a team of high school instructors throughout the state. A panel of experts in the field of health care reviewed the framework. The format and content of the framework reflect the specific training needs within the state of Arkansas. The framework content and format are modeled after a document originally developed by a writing team under the auspices of the Virginia Department of Education. Grateful appreciation is expressed to the Virginia Department of Education for granting the Arkansas State Department of Workforce Education access to its instructional frameworks.

Table of Contents

Introduction	7
Master Duty/Task List.....	8
Duty/Task Definitions for Human Anatomy and Physiology	
Structure of the Human Body.....	14
Integumentary System.....	16
Skeletal System.....	17
Muscular System.....	18
Circulatory System.....	20
Lymphatic System.....	22
Nervous System.....	23
Sensory System.....	25
Respiratory System.....	26
Digestive System.....	27
Urinary System.....	28
Endocrine System.....	29
Reproductive System.....	31
SkillsUSA/HOSA Task Definitions.....	33
Related Arkansas Standards of Learning	
Introduction.....	38
Reading and Writing.....	42
Mathematics.....	51
Science.....	62
All Aspects of Industry.....	78
Frameworks Cross Reference.....	82

Introduction

About the Program

The Medical Professions Education program prepares students for careers in the health care industry. The course sequence focuses on duties and tasks performed by professionals in health care as well as pre-employment and employment skills.

About the Document

- Section 1 contains a master duty/task list for the Human Anatomy & Physiology course.
- Section 2 contains an analysis of each task, consisting of the task, task definition, and process/skill questions to evaluate acceptable performance. All tasks have been designated essential. Essential tasks are those that must be achieved by every student pursuing the completion of the Human Anatomy & Physiology course.
- Section 3 lists the Arkansas Standards of Learning for language arts, mathematics, and science that are reinforced by instruction in the Human Anatomy & Physiology course. Academic skills in these areas are necessary for the mastery of a number of tasks performed by health care professionals.

Course Description

Experiences in Human Anatomy and Physiology are designed to provide students with basic information needed for a career in the health care field. In this comprehensive two-semester course, emphasis is given to all of the major body systems.

Master Duty/Tasks Listing

National and state experts in the occupational field of health care have validated the duties and tasks in this section. Each is analyzed by identifying the following:

- a *duty/task statement*, which describes what the student is to do

DUTY A: Structure of the Human Body
Task:
A001: Match terms related to the structure of the human body
A002: Identify the structures of a typical cell
A003: Know the functions of each cell structure
A004: Discuss the stages of cell division.
A005: Understand the processes that move materials in and out of cells
A006: Know the basic functions of the different types of tissue
A007: Discuss the relationship between cells, tissue, organs, and systems
A008: Identify body planes
A009: Match directional terms with correct descriptions
A010: Identify body cavities and the main organs found within each
A011: Know the abdominal regions
DUTY B: Integumentary System
Task:
B001: Match terms related to the integumentary system
B002: Know the functions of the skin
B003: Describe the layers of the skin
B004: Identify appendages of the skin
B005: Explore causes of abnormal skin colors

B006: Explore skin eruptions
B007: Describe common disorders of the skin
B008: Explore care of the skin, nails, and hair
DUTY C: Skeletal System
Task:
C001: Match terms related to the skeletal system
C002: Know the functions of the skeletal system
C003: Understand the structure and formation of bone
C004: Identify types of bones
C005: Explore axial and appendicular skeletons
C006: Know the different types of joints
C007: Differentiate between types of bone fractures
C008: Explore bone and joint injuries and disorders
DUTY D: Muscular System
Task:
D001: Match terms related to the muscular system
D002: Know the functions of muscles
D003: Discuss types of muscles
D004: Know the characteristics of muscles
D005: Discuss voluntary and involuntary muscles
D006: Explain the attachment of muscle to bone
D007: Explain the arrangement and movement of muscles in pairs

D008: Describe movements performed by muscles
D009: Know the principal muscles of the body
D010: Explore muscle disorders and injuries
DUTY E: Circulatory System
Task:
E001: Match terms related to the circulatory system
E002: Know the functions of the circulatory system
E003: Know the parts of the circulatory system
E004: Know the functions of heart structures
E005: Understand the physiology of blood circulation
E006: List the types of blood vessels
E007: Describe the composition of blood
E008: Discuss blood types
E009: Understand blood-clotting process
E010: Explore disorders of the circulatory system
DUTY F: Lymphatic System
Task:
F001: Match terms related to the lymphatic system
F002: Know the functions of the lymphatic system
F003: Know the structures of the lymphatic system and their functions
F004: Understand types of immunity
F005: Discuss Acquired Immunodeficiency Syndrome (AIDS)
F006: Explore disorders of the lymphatic system

DUTY G:
Nervous System
Task:
G001: Match terms related to the nervous system
G002: Know the functions of the nervous system
G003: Know the functions of neurons
G004: Understand the main divisions of the nervous system
G005: Know the parts of the brain to their function
G006: Know the structure and functions of the spinal cord
G007: Discuss cerebrospinal fluid
G008: Know the functions of the cranial and spinal nerves
G009: Explain reflex arc
G010: Explore disorders and injuries of the nervous system
DUTY H:
Sensory System
Task:
H001: Match terms related to the sensory system
H002: Know the functions of the sensory system
H003: Describe five special senses
H004: Understand why stimulation of a sense organ results in sensation
H005: Know the parts of the eye and their function
H006: Know the parts of the ear and their function
H007: Discuss other senses
H008: Explore disorders of the sensory system
DUTY I:
Respiratory System
Task:

I001: Match terms related to the respiratory system
I002: Designate functions of the respiratory system
I003: Match structures of the respiratory system to their functions
I004: Discuss the process of breathing and respiration
I005: Match abnormal breathing terms to their definitions
I006: Describe common disorders of the respiratory system
DUTY J: Digestive System
Task:
J001: Match terms related to the digestive system
J002: Know the functions of the digestive system
J003: Know the structures of the digestive system to their functions
J004: Discuss the accessory organs of digestion
J005: Understand the process of digestion
J006: Describe disorders of the digestive system
DUTY K: Urinary System
Tasks:
K001: Match terms related to the urinary system
K002: Know the functions of the urinary system
K003: Know the structures of the urinary system and their functions
K004: Know the function of parts of a nephron unit
K005: Understand the process of urine formation
K006: Understand the process of micturition
K007: Explore disorders of the urinary system

DUTY L: Endocrine System
Tasks:
L001: Match terms related to the endocrine system
L002: Know the functions of the endocrine system
L003: Know the structures of the endocrine system and their functions
L004: Know the hormones of the endocrine system and their functions
L005: Understand the process of hormone regulation
L006: Describe the response of the endocrine system to stress
L007: Discuss hormones used as medical treatments
L008: Explore disorders of the endocrine systems
DUTY M: Reproductive System
Tasks:
M001: Match terms related to the reproductive system
M002: Know the structures of the male reproductive system and their functions
M003: Know the structures of the female reproductive system and their functions
M004: Understand the phases of the menstrual cycle
M005: Discuss the physiology of reproduction
M006: Understand the changes that occur during menopause
M007: Discuss sexually transmitted diseases (STDs)
M008: Explore disorders of the reproductive system

Task Definitions

National and state experts in the occupational field of Human Anatomy & Physiology have validated tasks in this section. Each task is analyzed by identifying the following:

- a *task definition* (criteria for acceptable performance), which explains what the student has to do to perform the task at the expected level of mastery
- *process/skill questions*, which assess student knowledge and performance

Tasks are arranged by instructional duty area only. The placement of tasks into specific courses and the sequencing of tasks for instruction are local decisions based on student needs, employer demand, and school schedules.

DUTY A: Structure of the Human Body
Task:
A001: Match terms related to the structure of the human body <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • List and define terms related to the structure of the human body Process/Skill Questions
A002: Identify the structure of a typical cell <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Label parts of a cell • View prepared slides of various cells using a microscope Process/Skill Questions
A003: Know the functions of each cell structure <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • List the functions of each cell structure • Match functions to each cell structure Process/Skill Questions
A004: Discuss the stages of cell division <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • List and describe the stages of mitosis and meiosis • Illustrate the stages of mitosis and meiosis Process/Skill Questions

A005: Understand the processes that move materials in and out of cells

Definition: Process should include the following:

- Define endo- and exocytosis
- Describe the process of endocytosis
- Describe the process of exocytosis
- Differentiate between pinocytosis and phagocytosis

Process/Skill Questions

A006: Know the basic functions of the different types of tissue

Definition: Process should include the following:

- View prepared slides of various tissues using a microscope
- List the types of tissue
- Match tissue type to corresponding functions

Process/Skill Questions

A007: Discuss the relationship between cells, tissue, organs, and systems

Definition: Process should include the following:

- Differentiate between cells, tissue, organs, and systems
- Develop a flow chart showing the relationship between cells, tissue, organs, and systems

Process/Skill Questions

A008: Identify body planes

Definition: Process should include the following:

- Label the body planes

Process/Skill Questions

A009: Match directional terms with correct descriptions

Definition: Process should include the following:

- List and define directional terms

Process/Skill Questions

A010: Identify body cavities and the main organs found within each

Definition: Process should include the following:

- Use an anatomical model (torso) to label body cavities and the organs they contain

Process/Skill Questions

<p>A011: Know the abdominal regions</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Label the abdominal regions <p>Process/Skill Questions</p>
<p>DUTY B:</p> <p>Integumentary System</p>
<p>Task:</p>
<p>B001: Match terms related to the integumentary system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and define terms related to the integumentary system <p>Process/Skill Questions</p>
<p>B002: Know the functions of the skin</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and describe the functions of the skin <p>Process/Skill Questions</p>
<p>B003: Describe the layers of the skin</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Label a diagram of the skin • Differentiate between the layers of the skin <p>Process/Skill Questions</p>
<p>B004: Identify the appendages of the skin</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Label the appendages of the skin using a diagram • Describe the functions of each of the skin appendages <p>Process/Skill Questions</p>
<p>B005: Explore causes of abnormal skin colors</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Research an assigned skin disorder affecting skin pigmentation • Define melanocyte <p>Process/Skill Questions</p>

B006: Explore skin eruptions

Definition: Process should include the following:

- Match skin eruptions to the correct description

Process/Skill Questions

B007: Describe common disorders of the skin

Definition: Process should include the following:

- Research a disorder of the skin
- Discuss the diagnostic procedures of the skin
- List preventive measures against skin cancer
- List signs and symptoms of skin cancer

Process/Skill Questions

B008: Explore care of the skin, nails, and hair

Definition: Process should include the following:

- Analyze skin, hair, and nail care products

Process/Skill Questions

**DUTY C:
Skeletal System****Task:****C001: Match terms related to the skeletal system**

Definition: Process should include the following:

- List and define terms related to the skeletal system

Process/Skill Questions

C002: Know the functions of the skeletal system

Definition: Process should include the following:

- List and describe the functions of the skeletal system
- List the major parts of the skeletal system

Process/Skill Questions

C003: Understand the structure and formation of bone

Definition: Process should include the following:

- Label the structure of bone using a diagram
- Discuss the formation of bone beginning with infancy and ending with adulthood
- Discuss bone loss in the elderly

- List the factors that contribute to bone loss

Process/Skill Questions

C004: Identify types of bones

Definition: Process should include the following:

- Label the parts of a long bone
- Differentiate between long and short bones

Process/Skill Questions

C005: Explore axial and appendicular skeletons

Definition: Process should include the following:

- Label bones of the axial and appendicular skeletons

Process/Skill Questions

C006: Know the different types of joints

Definition: Process should include the following:

- List and describe the different types of joints
- Label the different types of joints using a skeleton

Process/Skill Questions

C007: Differentiate between types of bone fractures

Definition: Process should include the following:

- Illustrate the different types of bone fractures
- Describe the approach to repairing the different types of fractures

Process/Skill Questions

C008: Explore bone and joint injuries and disorders

Definition: Process should include the following:

- List and describe the more common bone and joint injuries
- Research an assigned bone disorder
- Describe the standard treatments of bone and joint injuries

Process/Skill Questions

**DUTY D:
Muscular System**

Task:

D001: Match terms related to the muscular system

Definition: Process should include the following:

- List and define terms related to the muscular system

Process/Skill Questions

D002: Know the functions of muscles

Definition: Process should include the following:

- List and describe the functions of muscles

Process/Skill Questions

D003: Discuss the types of muscles

Definition: Process should include the following:

- List and describe the different types of muscles
- Give examples of each type of muscle

Process/Skill Questions

D004: Know the characteristics of muscles

Definition: Process should include the following:

- Describe the characteristics of muscles
- Label and/or illustrate the components that make up a muscle
- Discuss striated and non-striated muscles

Process/Skill Questions

D005: Discuss voluntary and involuntary muscles

Definition: Process should include the following:

- Differentiate between voluntary and involuntary muscles
- Give examples of each

Process/Skill Questions

D006: Explain the attachment of muscle to bone

Definition: Process should include the following:

- Describe a tendon
- Label various tendons using a diagram

Process/Skill Questions

D007: Explain the arrangement and movement of muscles in pairs

Definition: Process should include the following:

- Demonstrate the movement of pairs of muscles

Process/Skill Questions

<p>D008: Describe the movements performed by muscles</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Demonstrate muscle movements • Practice active and passive range of motion exercises <p>Process/Skill Questions</p>
<p>D009: Know the principal muscles of the body</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Label the principal muscles • Research different sports to determine which muscles are used in each • Explore the effect of exercise and sports training on muscles <p>Process/Skill Questions</p>
<p>D010: Explore muscle disorders and injuries</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Research an assigned muscle disorder • List and describe the more common muscle injuries • Describe standard treatments for muscle injuries <p>Process/Skill Questions</p>
<p>DUTY E:</p> <p>Circulatory System</p>
<p>Task:</p>
<p>E001: Match terms related to the circulatory system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and define terms related to the circulatory system <p>Process/Skill Questions</p>
<p>E002: Know the functions of the circulatory system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and describe the functions of the circulatory system <p>Process/Skill Questions</p>
<p>E003: Describe the parts of the circulatory system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Label a diagram of the circulatory system <p>Process/Skill Questions</p>

E004: Explain the functions of heart structures

Definition: Process should include the following:

- Examine an animal heart or model of the human heart
- Match structures to their function
- Discuss common disorders of heart structures

Process/Skill Questions

E005: Describe the physiology of blood circulation

Definition: Process should include the following:

- Trace the path of blood circulation through the body
- Discuss blood pressure
- Differentiate between hydrostatic and osmotic pressure

Process/Skill Questions

E006: List the types of blood vessels

Definition: Process should include the following:

- Label the main arteries and veins
- Differentiate between an artery, vein, and capillary
- Label the parts of a capillary bed

Process/Skill Questions

E007: Describe the composition of blood

Definition: Process should include the following:

- List the main components of blood
- List the components of plasma
- Differentiate between plasma and serum

Process/Skill Questions

E008: Discuss blood types

Definition: Process should include the following:

- List the different blood types
- Discuss antigen and antibody differences between the different blood types
- Discuss universal donor and universal recipient
- Describe the process of blood transfusion
- Discuss the Rh factor

Process/Skill Questions

E009: Understand the blood-clotting process

Definition: Process should include the following:

- List the components involved in blood clotting
- Describe the blood-clotting process
- List factors that promote and/or prevent blood clotting

Process/Skill Questions

E010: Explore disorders of the circulatory system

Definition: Process should include the following:

- Explore diagnostic procedures of the circulatory system
- Research an assigned disorder of the circulatory system
- List and describe common disorders of the circulatory system

Process/Skill Questions

DUTY F: Lymphatic System

Tasks:

F001: Match terms related to the lymphatic system

Definition: Process should include the following:

- List and define terms related to the lymphatic system

Process/Skill Questions

F002: Know the functions of the lymphatic system

Definition: Process should include the following:

- List and describe the functions of the lymphatic system

Process/Skill Questions

F003: Know the structures of the lymphatic system and their functions

Definition: Process should include the following:

- Label a diagram of the lymphatic system
- Match structures to their function(s)

Process/Skill Questions

F004: Understand the types of immunity

Definition: Process should include the following:

- Describe the different types of immunity
- Give examples of the different types of immunity
- Discuss vaccinations
- Describe the initial immune response
- Define antibody

- Define antigen

Process/Skill Questions

F005: Discuss Acquired Immunodeficiency Syndrome (AIDS)

Definition: Process should include the following:

- Discuss measures to prevent transmission and acquisition of human immunodeficiency virus (HIV) for public and health care professionals

Process/Skill Questions

F006: Explore disorders of the lymphatic system

Definition: Process should include the following:

- Research an assigned disorder of the lymphatic system
- List and describe common disorders of the lymphatic system

Process/Skill Questions

**DUTY G:
Nervous System**

Tasks:

G001: Match terms related to the nervous system

Definition: Process should include the following:

- List and define terms related to the nervous system

Process/Skill Questions

G002: Know the functions of the nervous system

Definition: Process should include the following:

- List and describe the functions of the nervous system

Process/Skill Questions

G003: Know the parts and functions of neurons

Definition: Process should include the following:

- Identify the parts of a neuron
- Match the parts of a neuron to their function(s)
- Differentiate between sensory and motor neurons
- Discuss Na/K pump in impulse transmission
- Illustrate the conduction of a nerve impulse between two neurons

Process/Skill Questions

G004: Discuss the main divisions of the nervous system

Definition: Process should include the following:

- Contrast the actions of the divisions of the nervous system
- Develop a flow chart showing the divisions of the nervous system

Process/Skill Questions

G005: Know the parts of the brain and their functions

Definition: Process should include the following:

- Label a diagram of the brain
- Match the parts of the brain to their functions
- Discuss “handedness”

Process/Skill Questions

G006: Know the structures and functions of the spinal cord

Definition: Process should include the following:

- Label the parts of the spinal cord
- Match the parts of the spinal cord to their function(s)
- Differentiate between regions of the spinal column

Process/Skill Questions

G007: Discuss cerebrospinal fluid

Definition: Process should include the following:

- Describe the functions of cerebrospinal fluid
- Discuss the diagnostic procedures utilizing cerebrospinal fluid

Process/Skill Questions

G008: Know the functions of cranial and spinal nerves

Definition: Process should include the following:

- Differentiate between functions of cranial and spinal nerves
- Define effector

Process/Skill Questions

G009: Explain reflex arc

Definition: Process should include the following:

- Demonstrate reflex action
- Define reflex arc

Process/Skill Questions

<p>G010: Explore disorders and injuries of the nervous system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Investigate ways to prevent injuries to the nervous system • Research an assigned disorder of the nervous system • Research current advancements in the treatment of spinal cord injuries <p>Process/Skill Questions</p>
<p>DUTY H:</p> <p>Sensory System</p>
<p>Tasks:</p>
<p>H001: Match terms related to the sensory system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and define terms related to the sensory system <p>Process/Skill Questions</p>
<p>H002: Know the functions of the sensory system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and describe the functions of the sensory system • List the organs associated with the sensory system <p>Process/Skill Questions</p>
<p>H003: Describe the five main senses</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List the five main senses • Match the senses to the part(s) of the brain responsible for interpreting their signals <p>Process/Skill Questions</p>
<p>H004: Discuss why stimulation of a sense organ results in sensation</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Define sensation • Describe the process of sensation • Define perception <p>Process/Skill Questions</p>
<p>H005: Know the parts of the eye and their functions</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Label the parts of the eye • Trace the path of light as it moves through the eye

- Describe common disorders of the eye
- Match the parts of the eye to their corresponding functions

Process/Skill Questions

H006: Know the parts of the ear and their functions

Definition: Process should include the following:

- Label the parts of the ear
- Trace the path of sound as it moves through the ear
- Match the parts of the ear to their corresponding functions
- Describe common disorders of the ear

Process/Skill Questions

H007: Discuss other senses

Definition: Process should include the following:

- List and describe other senses

Process/Skill Questions

H008: Explore disorders of the sensory system

Definition: Process should include the following:

- Simulate the loss of a sense
- Research an assigned sensory system disorder

Process/Skill Questions

DUTY I: Respiratory System

Tasks:

I001: Match terms related to the respiratory system

Definition: Process should include the following:

- List and define terms related to the respiratory system

Process/Skill Questions

I002: Know the functions of the respiratory system

Definition: Process should include the following:

- List and describe the functions of the respiratory system

Process/Skill Questions

I003: Know the structures of the respiratory system and their functions

Definition: Process should include the following:

- Label the parts of the respiratory system
- Match the structures to their corresponding functions

Process/Skill Questions

I004: Discuss the process of breathing and respiration

Definition: Process should include the following:

- Define breathing and respiration
- List and describe the two types of respiration
- Illustrate the path of oxygen intake and CO₂ release through the respiratory system
- List the factors affecting the respiratory rate
- Discuss the role of the respiratory rate in maintaining homeostasis

Process/Skill Questions

I005: Match abnormal breathing terms to their definitions

Definition: Process should include the following:

- List and define abnormal breathing terms

Process/Skill Questions

I006: Explore common disorders of the respiratory system

Definition: Process should include the following:

- Explore ways to care for the respiratory system and improve its functioning
- Research an assigned disorder of the respiratory system
- Discuss lifestyle and environmental factors that contribute to the loss of respiratory function

Process/Skill Questions

**DUTY J:
Digestive System**

Tasks:

J001: Match terms related to the digestive system

Definition: Process should include the following:

- List and define terms related to the digestive system

Process/Skill Questions

J002: Know the functions of the digestive system

Definition: Process should include the following:

- List and describe the functions of the digestive system

Process/Skill Questions
<p>J003: Know the structures of the digestive system and their functions</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Label the parts of the digestive system • Match structures to their corresponding functions • List the digestive enzymes • List the digestive hormones
Process/Skill Questions
<p>J004: Discuss the accessory organs of digestion</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List the digestive accessory organs • Match accessory organs to their corresponding functions
Process/Skill Questions
<p>J005: Understand the process of digestion</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Trace the path of food in the digestive process • Illustrate the path of digestion for fats, carbohydrates, and proteins • Match digestive enzymes to the nutrients upon which they act
Process/Skill Questions
<p>J006: Explore disorders of the digestive system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Research an assigned digestive disorder • List environmental and lifestyle factors that affect digestion
Process/Skill Questions
DUTY K:
Urinary System
Tasks:
<p>K001: Match terms related to the urinary system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and define terms related to the urinary system
Process/Skill Questions
<p>K002: Know the functions of the urinary system</p> <p><i>Definition:</i> Process should include the following:</p>

- Describe the functions of the urinary system
- Discuss the urinary system's role in maintaining homeostasis

Process/Skill Questions

K003: Know the structures of the urinary system and their functions

Definition: Process should include the following:

- Label the parts of the urinary system
- Match structures to their corresponding function(s)

Process/Skill Questions

K004: Know the function of parts of a nephron unit

Definition: Process should include the following:

- Label the parts of a nephron
- Match the parts of the nephron unit to their corresponding function(s)

Process/Skill Questions

K005: Discuss the process of urine formation

Definition: Process should include the following:

- Trace the path of blood through the nephron
- List the hormones that affect the concentration of urine
- Describe the rennin-angiotensin system

Process/Skill Questions

K006: Explain the process of micturition

Definition: Process should include the following:

- Define micturition
- Label the parts of urinary system directly involved with micturition
- Describe the process of micturition

Process/Skill Questions

K007: Explore disorders of the urinary system

Definition: Process should include the following:

- Research a disorder of the urinary system.

Process/Skill Questions

**DUTY L:
Endocrine System**

Tasks:

L001: Match terms related to the endocrine system

<p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and define terms related to the endocrine system <p>Process/Skill Questions</p>
<p>L002: Know the functions of the endocrine system</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Describe the functions of the endocrine system • Differentiate between the endocrine and exocrine systems • Give examples of organs and hormones associated with each system <p>Process/Skill Questions</p>
<p>L003: Know the structures of the endocrine system and their functions</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Label the endocrine glands • Match structures to their corresponding hormone(s) <p>Process/Skill Questions</p>
<p>L004: Know the hormones of the endocrine system and their functions</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Match hormones to their corresponding function(s) • Develop a flowchart depicting the effects of hormones on other endocrine structures <p>Process/Skill Questions</p>
<p>L005: Understand the process of hormone regulation</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Discuss negative- and positive-feedback mechanisms • Describe negative- and positive-feedback mechanisms for various hormones <p>Process/Skill Questions</p>
<p>L006: Describe the response of the endocrine system to stress</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List the hormones involved during times of stress and their effects on the body • Discuss ill effects of prolonged stress <p>Process/Skill Questions</p>
<p>L007: Discuss hormones used as medical treatments</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Research the pros and cons of hormone/steroid treatments

Process/Skill Questions
L008: Explore disorders of the endocrine system <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Explore the factors that can cause disorders of the endocrine system • Research an assigned endocrine disorder
Process/Skill Questions
DUTY M:
Reproductive System
Tasks:
M001: Match terms related to the reproductive system <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • List and define terms related to the reproductive system
Process/Skill Questions
M002: Know the structures of the male reproductive system and their functions <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Label a diagram of the male reproductive system • Trace the path of sperm in the male body • Match structures to their corresponding functions • List secretions of the male reproductive system and specify their origin
Process/Skill Questions
M003: Know the structures of the female reproductive system and their functions <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Label a diagram of the female reproductive system • Match structures to their corresponding functions
Process/Skill Questions
M004: Explain the phases of the menstrual cycle <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Develop a chart depicting the menstrual cycle; include the different phases of the menstrual cycle and the changes occurring within the ovary, uterus, and pituitary gland • List the hormones involved in the menstrual cycle and describe their effect(s) on the uterus and ovarian follicle
Process/Skill Questions
M005: Discuss the physiology of reproduction

Definition: Process should include the following:

- Explain the process of fertilization
- Illustrate the process of reproduction from ovulation to implantation of the blastocyst
- Discuss the development of identical and fraternal twins

Process/Skill Questions

M006: Understand the changes that occur during menopause

Definition: Process should include the following:

- List the changes that occur to the following organs, systems, and traits in postmenopausal women: menstrual cycle, uterus, vagina, skin, cardiovascular system, vasomotor system, libido, fertility, and pituitary function
- Discuss the pros and cons of hormone replacement therapy

Process/Skill Questions

M007: Discuss sexually transmitted diseases (STDs)

Definition: Process should include the following:

- Research ways to prevent the transmission of STDs
- List signs and symptoms of STDs
- Discuss health risks associated with STDs

Process/Skill Questions

M008: Explore disorders of the reproductive system

Definition: Process should include the following:

- Discuss causes of infertility
- Debate the use of infertility drugs and treatments
- Research an assigned reproductive disorder

Process/Skill Questions

SkillsUSA/HOSA

DUTY A: Self-improvement
Task:
A001: Complete a self-assessment and identify individual learning styles <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Identify and list individual strengths • Identify and list areas in need of improvement Process/Skill Questions
A002: Discover self-motivation techniques and establish short-term goals <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Develop a list of short-term goals • Discuss ways to change or improve lifestyle appearance and behavior Process/Skill Questions
A003: Determine individual time-management skills <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Prepare and keep a time journal • Discuss ways to improve time-management skills Process/Skill Questions
A004: Define future occupations <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Search the Internet for career opportunities within specified fields of study • Prepare a presentation on a specified career area Process/Skill Questions
A005: Develop an awareness of cultural diversity and equity issues <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Research a tradition modeled by the individual's family • Develop personal philosophy statements regarding gender equity Process/Skill Questions

A006: Define the customer

Definition: Process should include the following:

- Differentiate between external and internal customers
- Discuss factors that contribute to poor customer relationships

Process/Skill Questions

A007: Recognize the benefits of doing a community service project

Definition: Process should include the following:

- Discuss and list ways to become involved in the community
- Develop a community service project

Process/Skill Questions

A008: Demonstrate effective communication with others

Definition: Process should include the following:

- Identify and list personal barriers to listening
- Develop a personal plan to overcome barriers to listening

Process/Skill Questions

A009: Participate in a shadowing activity

Definition: Process should include the following:

- Summarize the experience of the job shadowing activity

Process/Skill Questions

A010: Identify the components of an employment portfolio

Definition: Process should include the following:

- Identify the parts of a portfolio
- Design a personal employment portfolio

Process/Skill Questions

A011: List proficiency in program competencies

Definition: Process should include the following:

- Complete an interpersonal competency assessment

Process/Skill Questions

DUTY B: Civic, Social, and Business Awareness
Task:
B001: Measure/modify short-term goals <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Discuss steps to pursue short-term goal(s) Process/Skill Questions
B002: Identify stress sources <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • List personal sources of stress • Discuss techniques to cope with individual sources of stress Process/Skill Questions
B003: Select characteristics of a positive image <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Discuss actions and traits that lead to a positive image • Discuss actions and traits that lead to a negative image Process/Skill Questions
B004: Demonstrate awareness of government, professional organizations, and trade unions <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Identify the state governor, legislators, and senators • Identify professional organizations pertaining to specific career areas Process/Skill Questions
B005: Apply team skills to a group project <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Form a team to develop a class project Process/Skill Questions
B006: Observe and critique a meeting <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Attend a formal meeting held within the community • Critique the attended meeting Process/Skill Questions

B007: Demonstrate business meeting skills

Definition: Process should include the following:

- List and discuss the basic rules to ensure an orderly and business-like meeting
- Role-play appropriate meeting skills

Process/Skill Questions

B008: Demonstrate social etiquette

Definition: Process should include the following:

- Role-play appropriate social behavior
- Differentiate between good and bad manners

Process/Skill Questions

B009: Complete survey for employment opportunities

Definition: Process should include the following:

- Gather information on a particular employment opportunity of interest
- Conduct an Internet search of a specific career area

Process/Skill Questions

B010: Review a professional journal and develop a 3- to 5-minute presentation

Definition: Process should include the following:

- Develop a presentation on the content, purpose, and distribution of a particular professional journal

Process/Skill Questions

B011: Identify customer expectations

Definition: Process should include the following:

- List and discuss customer expectations
- Discuss the consequences of unmet customer expectations

Process/Skill Questions

B012: Complete a job application

Definition: Process should include the following:

- Obtain a job application from various businesses in the community
- Conduct a mock job interview

Process/Skill Questions

B013: Identify a mentor

Definition: Process should include the following:

- Define mentor
- Discuss ways in which a mentor can help an individual meet career goals

Process/Skill Questions

B014: Assemble your employment portfolio

Definition: Process should include the following:

- Develop an employment portfolio

Process/Skill Questions

B015: Explore supervisory and management roles in an organization

Definition: Process should include the following:

- Examine an organizational chart
- Discuss the responsibilities of managers and supervisors

Process/Skill Questions

B016: Recognize safety issues

Definition: Process should include the following:

- Discuss the safety issues within a given career area

Process/Skill Questions

B017: Evaluate your proficiency in program competencies

Definition: Process should include the following:

- Define task and competency
- List competencies associated with a specified career area

Process/Skill Questions

Curriculum Frameworks

Purpose

This section of the framework contains material to help instructors in technical and professional programs reinforce basic skills in the areas of Reading and Writing, Mathematics, and Science. The technical portion of this guide takes a more direct approach by using specific duty and task listings, but changes in the academic section lead in a more general direction. The reason for this is simple: All good instructors do not teach in the same way. However, all good instructors share the trait of being able to connect their material to everyday life. For example, understanding concepts related to heat are important for cosmetology students as well as lathe operators in manufacturing plants. However, each program will probably take a different approach in the amount of detail and examples relating to heat concepts. Both groups require basic science knowledge of principles relating to heat, but the application of the principles will be different.

Basic Skills: The Content Areas

Included in this guide are materials to support basic skills in Reading and Writing, Mathematics, and Science. The overall approach taken here is a move toward problem-solving skills. By problem solving, we mean the ability to take information and use it for a purpose: to take action, make decisions, predict outcomes, suggest improvements. Another term for these thinking skills is a general “literacy.”

Literacy skills always have been in demand in the workplace. A quick review of workplace training programs and other literature regarding adult education demonstrates that the need for a literate workforce is still one of the most pressing problems employers face today. Indeed, many employers (from small- and medium-sized businesses to Fortune 500 companies) have spent hundreds of millions of dollars on in-house basic skills training programs.

What constitutes a literate workforce? There are many definitions for literacy and hundreds of tests that measure it, but when employers are asked what they’re looking for in potential new hires, the answers are general: They want individuals who can read and write; show up on time;

think and solve problems; and keep their personal lives in order (that is, don't bring a drinking problem into the workplace).

Viewed in this way, the words “literacy” and “literate” are good terms for what educators are trying to instill in their students, the future workforce. The more common definition (being able to read and write) is certainly appropriate, but the additional definitions (knowledgeable, educated, and well-informed) are also apt. It is this broad term, “literate,” that we use to guide instructors on what to cover in the classroom. No matter which Career and Technical Education area is being focused on, no matter how technical the terminology is, instructors are given the task of helping students take information, break it down into necessary parts, process details, and be able to come away with an understanding of some sort. This is “literacy,” and the process is the same for every subject area--teaching students how to think and solve problems.

Format

Each section includes a two-column table. Skills are listed on the left side; suggestions for implementing these skills into the curriculum are listed on the right side. Each suggestion is written in such a way that it can be tailored to most Career and Technical Education programs.

Using the Guide

This guide was prepared with four concepts in mind:

- The instructor is *aware of the need* for students to improve their basic skills.
- The instructor is the *best-qualified person* to decide how to include this material in the classroom or lab. The students' abilities and needs should drive the instructor in deciding how to use, expand, or modify these topics.
- The instructor *already has curriculum that works* for his or her students. Therefore, the suggestions for reinforcing basic skills
 - must be easy to implement.
 - must stand alone.
 - do not need to be taught in a particular order.
 - must be open-ended enough to be useful for any career and technical program.

- ***Time is limited.*** Unless there are quick ways to reinforce basic skills, changes to the curriculum will not be made. Teaching basic skills in the context of technical material will help students make connections that are more memorable and will require no additional lesson planning. Just as instructors incorporate updates in technical knowledge, they can add basic skills concepts as well. Adding a few concepts at a time will help students perform better in the lab as well as on tests and evaluations.

Methods

The following methods may help instructors decide how to increase basic skill knowledge:

- *Collaborative projects* -- how could a joint project between regular education teachers and vocational instructors reinforce concepts for both programs?
- *Outside assignments* -- would students benefit from an outside assignment explaining how a basic math (science, reading) concept ties to a process in the lab?
- *Extra credit* -- students needing extra credit can research outside topics and turn in a short summary of material.
- *“Need-to-know” assignments* -- students prepare a bulleted list of the basic concepts in science they need to know to correctly perform ____ operation in the lab.
- *Question of the day* -- a few daily math problems for students to answer at the beginning of class allow the instructor to set the tone for the material. This method also gives students an immediate goal when they enter the classroom and teaches them to stay on task. Bonus points may be awarded at the end of the week, quarter, semester, etc.
- *Two-minute oral presentations* -- students who need to practice speaking skills can be asked to give a two-minute oral presentation at the end of class summarizing the main points for the day. Or, a two-minute presentation at the beginning of class can recap the material from a previous class.
- *Connecting with workers* -- students can poll parents, friends, area employers, or other people to find out the top five basic science skills needed on the job.
- *Direct questioning* -- include a few basic knowledge questions in a presentation. Award points to groups based on correct answers.

Resources

In creating the Academic Reinforcement material for the technical and professional frameworks, we used a number of source documents and resources.

- The English Language Arts, Science, and Mathematics components of the *Curriculum Improvement Project* by Dr. Willard Daggett were consulted to ensure that the top-ranked skills in those areas would be reflected in the academic support material. The English Language Arts and Science components have many linkages to the material included here. (The higher-level math skills such as trigonometry were not included in this document.)
- The Workplace Skills Enhancement Program (WSEP) at the University of Arkansas at Little Rock (UALR) has completed many training projects and job profiles for employers in Arkansas and has collected data from this work with Arkansas employers. Our constant contact with workers and employers provides a tremendous amount of data that we use in designing customized training programs and in working on projects such as curriculum frameworks. Also, the staff of WSEP has experience teaching in Arkansas public schools, the U.S. military, and Job Corps.
- Additionally, other groups within UALR (the Labor Education Program, the Institute for Economic Advancement, and the College of Business) provide resources regarding health and safety information, labor unions and their role in the workplace, computer and information technology, and other training and outreach program data.
- The U.S. Department of Labor (DOL) has many online documents and publications that support workers and issues regarding the workplace. (Work by Philippi and Greenan, 1988, on workplace skills was especially helpful.) Visit the Web site at www.dol.gov.
- The Occupational Safety and Health Administration (OSHA) provides online and other resources for instructors and professionals. For topics relating to safety and health, visit www.osha.gov.
- The Multistate Academic and Vocational Curriculum Consortium (MAVCC) is an organization that develops competency-based curriculum. For more on MAVCC, see www.mavcc.org.

ACADEMIC STANDARDS FOR READING AND WRITING

Strategies for Reinforcement in the Career and Technical Education Classroom

Note:

*** indicates industry-related materials, handouts, notes, etc.**

Objective	Classroom Applications to Industry
<p><i>Present</i> <i>Review, and discuss</i> Master the list of skills employers want for the workplace regarding reading and writing</p>	<p>Use the list of skills employers want to introduce students to the requirements of the workplace.</p> <p>Depending on students' ability levels, any of the following methods may be used to increase their understanding of the concepts:</p> <ul style="list-style-type: none"> • Discussion • Interviewing parents or other adults in the workplace about the skills required • Interviewing employers about the skills in terms of importance • Identifying workplace situations in which certain skills become more important than others • Researching adult education programs to learn why deficits in these areas must be remediated and the cost spent yearly on these programs • Researching the topic of adult literacy
<p><i>Answer</i> simple comprehension or recall questions from a lecture or from written material</p>	<p>Provide two examples of workplace materials* on students' reading level.</p> <p>With the first, allow students to read information and then answer brief recall questions. With the second example, read aloud the material but do not give a handout. Ask brief recall questions.</p> <p>Compare the differences. How do students retain information better—orally or</p>

	visually? Discuss learning styles and impact on the job.
<i>Follow, give</i> oral instructions	Using instructions for a hands-on task, have students give <u>oral</u> instructions to a partner or group. Rate the effectiveness of the speaker.
<i>Follow, give</i> written instructions	Using a short list of instructions for a hands-on task, have students give <u>written</u> instructions to a partner or group. Rate the effectiveness of the speaker.
<i>Show</i> the difference between relevant and irrelevant details	Using a copy of workplace materials*, students underline relevant or important details in red, irrelevant or less important details in blue.
<i>Sort</i> objects based on x number of criteria	Using workplace materials*, sort a group of objects based on characteristics identified by instructor (e.g., by color, shape, defect, or a combination of these).
<i>Recognize, identify</i> technical vocabulary	<p>Using workplace materials*, highlight technical vocabulary terms.</p> <p>Create a class dictionary of industry-related technical vocabulary. Students may add illustrations or diagrams. Each student receives a copy of the final product. Emphasize skills such as alphabetical order, guidewords, prefixes, suffixes, and pronunciation guides.</p>
<i>Read</i> aloud	Read aloud from workplace materials* in groups or individually.

<i>Identify, explain symbols, abbreviations, and acronyms relevant to subject area</i>	<p>Using workplace materials*, highlight symbols, abbreviations, and acronyms.</p> <p>Create a table with one column for each: symbols, abbreviations, acronyms. Classify each one and write in the meaning.</p>
<i>Understand, use rules of grammar, usage, spelling, punctuation</i>	<p>Identify the missing punctuation marks, misspelled words, and incorrect use of grammar from workplace materials*.</p> <p>Correct the mistakes.</p>
<i>Discuss uses and purposes of a variety of workplace communication tools</i>	Find examples of a business letter, memo, report, brochure, proposal, schematic, map, and diagram.
<i>Duplicate process demo by instructor</i>	Using a workplace process, demonstrate steps to complete and have students perform individually or in groups.
<i>Notice, apply word analysis techniques</i>	Using workplace materials*, identify prefixes, suffixes, or roots that indicate meaning (e.g. therma = heat). ¹
<i>Match parts from photographs or diagrams to actual objects</i>	Using workplace materials*, follow a sequence of pictures or diagrams to build, create, or copy an item or process.
<i>Read for main ideas and details</i>	Use a graphic organizer ¹ to show main ideas and supporting details.
<i>Distinguish between fact, opinion, and inference</i>	Collect examples of materials based on fact or opinion/inference. Ask students to underline key terms that indicate the presence of facts or opinions.
<i>Distinguish between rows and columns</i>	Using charts or tables from workplace materials*, discuss the reasons for this format.
<i>Identify a cell as a block where a row and column intersect</i>	Identify the quantity in a particular cell.

<i>Select, use appropriate resources and reference tools</i>	<p>Explain the uses for the following: dictionary, thesaurus, almanac, atlas, card catalog, encyclopedia.</p> <p>List reasons for choosing one reference tool over another.</p> <p>Use reference tools to answer questions related to industry or current events.</p>
<i>Paraphrase written or oral material into summary form</i>	<p>Using workplace materials*, determine the best way to condense or shorten the material so as to give an overview to a layperson.</p> <p>Using a set of guidelines appropriate to students' level in length and detail, summarize the information into bullet points.</p>
<i>Interpret, fill out/complete forms and records</i>	<p>Using workplace materials*, answer basic questions (e.g., summarize the list of parts from an inventory).</p> <p>Using blank forms or documents, fill in details. Pay close attention to directions. Students critique work with a partner.</p> <p>Create a form or document to be used in a workplace process.</p>
<i>Use, develop a process for remembering details</i>	<p>Use pneumatic devices to organize and remember details. Pneumatic devices¹ include Semantic Maps, Thought Webs, and other creative tools to organize thinking.</p>
<i>Proofread, correct mistakes in written drafts</i>	<p>Using a newspaper article, locate and mark mistakes in grammar, punctuation, or usage.</p> <p>Correct mistakes in written drafts.</p>
<i>Examine different types of writing used in the workplace (reports, memos, brochures, logs, blueprints, formulas, etc.)</i>	<p>Gather samples of workplace materials*. Identify each by type.</p> <p>Compare and contrast the difference</p>

	<p>between:</p> <ul style="list-style-type: none"> audience (who the document is written for), length, background information/education needed to understand material, level of detail, organization and layout of the document.
<i>Understand the writing process</i>	<p>In order to apply the writing process, create a workplace communication tool to be used for a specific purpose.</p> <p>Prewrite:</p> <p>Brainstorm, gather facts, or do research to create a <u>business letter, memo, report, brochure, proposal, schematic, map, or diagram</u>.</p> <p>Identify the audience.</p> <p>Determine the purpose of the document.</p> <p>Write:</p> <p>Create a first draft.</p> <p>Revise and Edit:</p> <p>Make changes to ensure accuracy.</p> <p>Look at the writing from a different point of view.</p> <p>Shorten or make more concise where possible.</p> <p>Use white space, bold print, and other formatting details to make the document easy to read.</p> <p>Publish:</p> <p>Decide on the best format for the final copy (size, type of material, layout, graphics, etc.)</p> <p>Publish the final draft.</p>

<p><i>Identify, create</i> sentences of different types</p>	<p>Using workplace materials*, find sentences of varying types. Examples include simple sentences (subject + predicate) and complex sentences (subject + predicate including clauses).</p> <p>Write sentences, paragraphs, or essays using sentences of different types (e.g., write a two-paragraph summary of today's lesson).</p>
<p><i>Identify, use</i> contractions correctly</p>	<p>Using workplace materials*, locate contractions (e.g., isn't, I'll).</p> <p>Identify misuses of contractions.</p> <p>Write a short list of directions relating to an industry process, and use as many contractions as possible.</p>
<p><i>Identify, use correctly</i> commonly misspelled words</p>	<p>Using a list of commonly misspelled words¹, locate errors in the media (newspaper articles, Internet sites, magazines).</p> <p>Ask each student to identify his/her problem words from the list.</p> <p>Attempt to incorporate problem words into class activities (e.g., add them to a list of work instructions).</p> <p>Give short weekly quizzes focusing on five words per week. Award bonus points.</p>
<p><i>Identify, use correctly</i> the English irregular verbs</p>	<p>From a list of irregular verbs, review the uses of each.</p> <p>Ask each student to identify his/her problem irregular verbs from the list.</p> <p>Attempt to incorporate problem verbs into class activities, such as making a collection of mistakes from print sources.</p>

<i>Identify, use</i> signal words and other cues to improve writing	<p>Use a list of signal words¹ and discuss their purpose in writing (signal words are words that raise a flag to a reader to pay attention). Examples --</p> <p>Signal words showing emphasis: Most of all, It should be noted, Of course</p> <p>Signal words showing a conclusion: Lastly, In summary, Finally</p> <p>Identify common signal words in workplace writing, especially in sequenced lists.</p> <p>Write a list of work instructions using signal words.</p>
<i>Identify</i> components of workplace documents such as blueprints, schematics, floor plans, and other industry-related documents	Label the parts of a workplace document.
<i>Place</i> steps in proper sequence	Using a list of steps or pictures, cut them apart so students can place them in the proper order.
<i>Analyze</i> cause and effect	Experiment with cause and effect in the classroom (e.g., change the sequence of events in a process).
<i>Determine</i> missing information	<p>Locate the information that is missing from a problem, and explain why the problem cannot be solved without it.</p> <p>To reinforce concepts, use a completed problem and remove the important details. Ask students if they can identify what's missing.</p>
<i>Differentiate</i> between tools used for a job	Given a list of tools and a list of functions, identify the most efficient tool for each task.
<i>Assemble or disassemble</i> objects	From a list of oral or written instructions, assemble an object or complete a process.

	Students write the instructions for disassembly.
<i>Cross-reference</i> materials to compare information	Using more than one source document, compare the information given.
<i>Interpret</i> reasoning behind rules or regulations	Using workplace materials*, make a list of possible reasons or justifications for a safety guideline, regulation, etc.
<i>Show contrasts</i> between approaches	<p>Given a workplace scenario, write a brief approach to solving the problem. (Working in groups would be beneficial.)</p> <p>Compare and contrast each approach from the perspective of a worker, manager, supervisor.</p>
<i>Organize</i> data in a new format	Using workplace materials*, organize the information into a new format.
<i>Prove</i> a rule or method's sufficiency	Perform an experiment to determine how much tolerance is acceptable in a case study (e.g., find the range of drops of red dye sufficient to match the standard red color used in latex paint).
<i>Show</i> relationships between two or more systems	Using two or more partners related to industry, show or explain how they are interrelated (e.g., explain the relationship between social workers and hospitals).
Given examples of emergency situations, identify a real-world course of action	Using an emergency situation common to your industry, outline a step-by-step plan for action.
<i>Identify</i> variables that affect the outcome of a process	Experiment with or predict variables that affect the outcomes for a process (e.g., weather patterns that adversely affect a process, such as building a road).
<i>Infer</i> situations that meet guidelines when complete information is not available	Given a policy or industry standard that has debatable interpretations, list possible situations that can arise that do not have clear solutions in the policy.

	Discuss or debate the issues.
<i>Compare finished products to a set of guidelines</i>	<p>Compare a set of objects to a set of guidelines (e.g., analyze a batch of parts and document how they do or do not meet a set of Quality Assurance guidelines).</p> <p>List any discrepancies (parts that do not meet guidelines) and categorize them by type (e.g., burns, holes, etc).</p>
<i>Identify preventive measures for maintenance of a system</i>	List the needed routine maintenance to keep a system working properly.
<i>Predict new standards or rules that may become necessary in the future</i>	<p>Identify recent areas of change or development in your industry.</p> <p>Discuss potential future needs or developments that may occur (e.g., potential need for better training requirements for airport personnel).</p>
<i>Improve a process by streamlining (locating waste) or decreasing lost time</i>	<p>Examine a process in industry in step-by-step detail. Suggest ways to decrease time needed or make the process more efficient.</p> <p>Isolate the cause of failure in a process by performing an experiment.</p>
<i>Prepare a model explaining a concept</i>	Build, draw, or create a model that explains a concept (e.g., show a need for environmental standards for water or air pollution).

¹ Fry, Edward; Kress, Jacqueline; Fountoukidis, Dona. *Reading Teacher's Book of Lists*, 4th ed. ISBN 0-13-028185-9.

ACADEMIC STANDARDS FOR MATHEMATICS

Strategies for Reinforcement in the Career and Technical Education Classroom

Note:

*** indicates industry-related materials, handouts, notes, etc.**

Topics Listing
Problem Solving
Operations and Calculations
Applications
Data Analysis and Display

Objectives	Classroom Applications to Industry
<p><i>Present</i> <i>Review and discuss</i> Master the list of skills employers want for the workplace regarding mathematics</p>	<p>Use the list of skills employers want to introduce students to the requirements of the workplace.</p> <p>Depending on students' ability levels, any of the following methods may be used to increase their understanding of the concepts:</p> <ul style="list-style-type: none"> • Discussion • Interviewing parents or other adults in the workplace about the skills required • Interviewing employers about the skills in terms of importance • Identifying workplace situations in which certain skills become more important than others • Researching adult education programs to learn why deficits in these areas must be remediated and the cost spent yearly on these programs • Researching the topic of adult literacy
PROBLEM SOLVING	
<p><i>Examine, apply</i> problem-solving process</p>	<p>Define the problem What is being asked?</p> <p>Decide on a type of solution. Multi-step or single-step question?</p>

	<p>Try any of these:</p> <ul style="list-style-type: none"> Estimate an answer Draw a diagram Find a pattern Guess and check Logical reasoning Make a graph Make an organized list Make a table Solve a simpler problem Use a simulation Work backwards Write an equation <p>Locate information you need. Do you have all the components?</p> <p>Get missing information. You may need to perform some other calculations</p> <p>Calculate. Look at the answer. How should the remainder be expressed?</p> <p>Check the solution. Is it reasonable?</p>
OPERATIONS AND CALCULATIONS	
<i>Read, write and count numbers</i>	<p>Read and write numbers (especially focus on very large and very small numbers where mistakes are common).</p> <p>Give a weekly quiz asking students to compare and sequence numbers.</p> <p>Example: 0.4445 ____ 0.4455 > or <</p> <p>Put these in order from smallest to largest: 0.66, 0.677, 0.67</p>
<i>Round numbers</i>	<p>Discuss your industry's use of decimals.</p> <p>Identify the place values needed to adequately</p>

	<p>perform a job. For example, a Quality Assurance Technician who works on the line in a manufacturing plant may need to use numbers through the ten-thousandths decimal place.</p> <p>Take a series of sample measurements, and round them to the nearest decimal place identified by the instructor.</p>
<i>Estimate numbers</i>	<p>The skill of making close estimations is tied to understanding accuracy. Discuss real-life situations in which estimation is used.</p> <p>Discuss the practice of estimation before calculation. Regular practice in estimating before calculating will teach students where they make errors and will increase their estimation skills.</p> <p>Discuss work situations in which estimation skills are required and possible consequences of making estimation errors. For example, is an estimate appropriate for inventory purposes? For ordering supplies?</p>
<i>Compute averages</i>	<p>Discuss averages in general terms. Calculate the average temperature, average rainfall or precipitation, average number of students per class, and other relevant examples.</p> <p>Using workplace materials*, calculate a series of averages.</p> <p>For example:</p> <ul style="list-style-type: none"> • Take 10 different measurements of a piece of pipe using a micrometer. • Compare the measurements. • Find the average of all the measurements. • Compare the average to the smallest and largest measurement. • Discuss the effects on quality. When is an average an acceptable benchmark measurement?

<i>Calculate with whole numbers; perform one-step problems with basic operations</i>	Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of addition, subtraction, multiplication, and division.
<i>Perform problems that require an understanding of the order of operations</i>	<p>Using workplace materials*, make a list of situations or problems that need more than one step to perform them.</p> <p>If the procedures (add, subtract, multiply, divide, etc.) are on the same level of importance, such as adding or subtracting, then the order of operations will not impact the way the problem is solved.</p> <p>If a problem requires more than one level of operation to solve (example, dividing and adding), work the problem correctly by performing the division part first and then the addition.</p> <p>Rework the problem using addition first. Compare the answers.</p> <p>Discuss the importance of reasoning skills to verify that an answer makes sense.</p>
<i>Understand the relationship between decimals, fractions, and percentages</i>	Make a table comparing fractions, decimals, and percentages.
<i>Compute with fractions, decimals, and percentages, and show an understanding of the relationship between them</i>	<p>Create sample problems using fractions that relate to everyday situations.</p> <ul style="list-style-type: none"> ▪ Poll the class on interesting topics (favorite food). Convert whole numbers to fractions. Votes: <ul style="list-style-type: none"> Pizza- 10 Salad- 2 BBQ- 8 <p>$10+2+8 = 20$ (recognize denominator value)</p> <p>$\frac{10}{20}$ Pizza $\frac{2}{20}$ Salad $\frac{8}{20}$ BBQ</p>

	<ul style="list-style-type: none"> ▪ Add the fractions. $\frac{10}{20} + \frac{2}{20} + \frac{8}{20} = \frac{20}{20}$ ▪ Convert the fractions to a whole number. (Total answer equals one class' worth of answers.) $\frac{10}{20} + \frac{2}{20} + \frac{8}{20} = \frac{20}{20} = 1$ ▪ Convert the fractions to percentages. $\frac{10}{20}$ means 10 divided by 20 = 0.50 0.50 = 50% Move the decimal two places to the right. 0.50 = 50% $\frac{2}{20}$ means 2 divided by 20 = 0.10 0.10 = 10% $\frac{8}{20}$ means 8 divided by 20 = 0.40 0.40 = 40% 50% + 10% + 40% = 100% Notice the totals add to 100%. So, $\frac{20}{20} = 1 = 100\%$ <p>Using workplace materials*, calculate work-related questions using fractions, decimals, and percentages.</p> <p>Calculate shipping costs for Internet purchases (such as music from amazon.com).</p>
<i>Solve formulas and equations</i>	<p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of equations.</p> <ul style="list-style-type: none"> ▪ Work left to right ▪ Use order of operations ▪ Place numbers on one side, variables on the other side

<i>Obtain squares and square roots</i>	<p>Review the methods for calculating squares, square roots, cubes, and cube roots. Use industry-related formulas to demonstrate examples.</p> <p>Compare the difference between the two common answers to 32 (answer = 9, not 6). How would an incorrect value affect the work on the job?</p>
<i>Convert units of measure: Recognize components of measuring systems (U.S. and metric) for length</i>	Discuss industry measures and terms relating to length.
<i>Convert units of measure: Recognize components of measuring systems (U.S. and metric) for mass/weight</i>	Discuss industry measures and terms relating to mass/weight.
<i>Convert units of measure: Recognize components of measuring systems (U.S. and metric) for volume</i>	Discuss industry measures and terms relating to volume.
<i>Measure with a certain degree of accuracy</i>	<p>Estimate measurements.</p> <p>Using workplace materials* and tools, take measurements of work-related and classroom items.</p> <p>Depending on ability level, students may measure to the nearest foot, inch, centimeter, etc.</p>
APPLICATIONS	
<i>Solve word problems</i>	Help students feel more comfortable with word problems by placing simpler problems in word problem form; or take concepts students have already mastered and ask them to write word problems for each other to solve.
<i>Select/apply mathematical formulas</i>	Review a set of math formulas and then a list of sample problems. Decide which formula(s) apply to each problem.
<i>Understand the importance of time in the workplace</i>	Using workplace materials*, make a list of workplace scenarios that require using time

	correctly, such as keeping a time card or heating a liquid solution for 20 minutes.
Recognize components of time systems (clocks and calendars)	a.m. and p.m. Leap year Military time
Discuss, identify, understand terms relating to measuring time	Discuss the units of time measurement and time vocabulary: second, minute, hour, day, week, month, year, leap year, fiscal year, quarter, annual, biannual, etc.
Understand that time can be expressed in terms of equivalencies	Show the time equivalencies using fractions. For example: $1 \frac{1}{2} \text{ days} = \underline{\hspace{1cm}} \text{ hours}$ $\begin{array}{rcl} 1 \text{ day} & = & 24 \text{ hours} \\ + \frac{1}{2} \text{ day} & = & +12 \text{ hours} \\ \hline 1 \frac{1}{2} \text{ days} & = & 36 \text{ hours} \end{array}$
Compute time conversions	Make a table that shows the equivalencies of time units. Compute conversion problems at the appropriate level of difficulty. Examples include: <ul style="list-style-type: none"> • Convert minutes to hours • Convert hours to days • Convert seconds to years
Calculate ratio and proportion	Review fractions when discussing ratio and proportion. Draw common classroom items to scale by finding a conversion rate (1 foot equals 1 inch). Make predictions using ratios. (If each student in the class has three children, how many children will there be altogether? Write the ratios.)
Apply geometry principles: Use formulas for measuring shapes of two dimensions	Determine the formulas that apply to two dimensions: perimeter, area, surface area. Find the perimeter of the classroom.

	<p>Discuss the perimeter of objects that are not shaped as perfect squares. How does this change the formula for perimeter?</p> <p>Find the area of the tiles on the floor.</p> <p>Find the area of the classroom.</p> <p>Review that all areas are expressed in terms of square units (square inches, square miles, etc.).</p>
<i>Apply geometry principles: Use formulas for measuring shapes of three dimensions</i>	<p>Review the formulas that apply to three dimensions of objects: volume.</p> <p>Find the volume of common objects such as soda cans, pizza boxes, etc.</p> <p>Review that volume is expressed in cubic units.</p> <p>Discuss industry-specific needs for these formulas. For example, find the volume of a tank or silo.</p>
<i>Define terms relating to money</i>	<p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles relating to money.</p> <p>For more advanced students, include terms and principles of economics, finance, or statistics.</p>

<i>Perform one-step problems involving money</i>	Make change. Count up (rather than backwards) to make change.
<i>Perform multiple-step problems using money</i>	Calculate gross and net earnings. Calculate <ul style="list-style-type: none"> ▪ Interest ▪ Sales tax ▪ Percent off ▪ Sale price ▪ Profit percentages Perform banking transactions.
<i>Perform business-related financial activities</i>	At a level of complexity appropriate to your industry and to students' ability levels, solve income/expense problems, prepare budgets, etc.
<i>Use a calculator to perform computations</i>	Identify appropriate activities that can be performed using a calculator (calculators allow students to concentrate on problem-solving strategies). Award prizes for weekly activities or competitions.
<i>Calculate measurements taken from measuring devices</i>	Add, subtract, multiply, and divide measurement numbers by plugging them into formulas.
<i>Perform/prepare an inventory</i>	Use a sample group of items to prepare an inventory. Review inventory vocabulary terms. Discuss the math processes that would apply to the inventory process.
DATA ANALYSIS AND DISPLAY	
<i>Recognize types of visual representations</i>	Charts Graphs Tables

<i>Interpret</i> charts, graphs, and tables	<p>Answer simple questions about charts, graphs and tables.</p> <p><i>Solve</i> multi-step problems involving the correlation of graphs and tables.</p>
<i>Collect/record</i> data	<p>As appropriate to industry, practice sampling methods. Discuss safety precautions for sampling. Visit OSHA at the Department of Labor Web site for more details.</p> <p>Practice collecting and recording sample data from your industry (such as measurements taken using a micrometer). Compare class answers.</p> <p>Find the range of answers (maximum and minimum). Find the average.</p> <p>Discuss an acceptable range of answers (\pm), and graph the results showing the number that fell inside and outside the acceptable range.</p>
<i>Review and apply</i> principles of probability	<p>Use real-life examples that are highly motivating to direct the students' attention to probability principles.</p> <p>(Example, "I am thinking of a number between 1 and 50. The person who guesses the number will receive that many bonus points if s/he can tell me the probability of choosing the number correctly.")</p>
<i>Use</i> probability models to predict chance events	<p>Calculate <u>theoretical probability</u> of an event (e.g., the probability of rolling a 5 on a die is $1/6$).</p> <p>Find <u>empirical probability</u> of an event by performing repeated experiments. Compare the two probabilities.</p>
<i>Calculate and interpret</i> statistics	<p>Identify the importance of using statistics correctly.</p> <p>Bring examples of statistics from the news or</p>

	<p>media and analyze them: Are they ambiguous? Are they correct? What data is the advertisement trying to get the public to see?</p> <p>For a humorous look at statistics, see <i>How to Lie with Statistics</i> by Huff and Geis.</p>
<i>Interpret</i> plans/blueprints	<p>Review vocabulary and terms for plans, blueprints, and schematics.</p> <p>Build a plan or blueprint one layer at a time, starting with the basic identifying information.</p> <p>Add layers of wax paper or other transparent drawing material on top of the first layer that allows each layer to be viewed individually or the entire drawing as a whole.</p>
<i>Construct</i> charts and tables	<p>Discuss chart types and chart vocabulary.</p> <p>Using workplace or sample data from the class, construct tables and charts.</p> <p>For a daily example, consult <i>USA Today</i> online and look for the snapshots section that shows a graph of some sort. Ask weekly bonus questions about the data.</p> <p>Challenge students to bring in examples of charts and graphs containing errors.</p>

ACADEMIC STANDARDS FOR SCIENCE

Strategies for Reinforcement in the Career and Technical Education Classroom

Note:

*** indicates industry-related materials, handouts, notes, etc.**

Topics Listing

General Science: Topics not specific to a content area

Physical Science: Mechanics and Physics
Energy and Waves
Thermodynamics
Electromagnetism
Chemistry
Optics

Life Science: Cell Biology
Evolution
Genetics and Heredity
Human and Animal Development

Anatomy: Ecology
Viruses
Bacteria
Plants

Earth Science: Earth in Space
Solar System/Astronomy
Atmosphere and Weather
Oceans and Water

Objective	Classroom Applications to Industry
GENERAL SCIENCE	
<p><i>Present</i> <i>Review and discuss</i> Master the list of skills employers want for the workplace regarding science skills</p>	<p>Use the list of skills employers want to introduce students to the requirements of the workplace.</p> <p>Depending on students' ability levels, any of the following methods may be used to increase their understanding of the concepts:</p> <ul style="list-style-type: none"> • Discussion • Interviewing parents or other adults in the workplace about the skills required • Interviewing employers about the skills in terms of importance • Identifying workplace situations in which certain skills become more important than others • Researching adult education programs to learn why deficits in these areas must be remediated, and discover the cost to employers to educate adult workers • Researching the topic of adult literacy
<p><i>Perform</i> computations as required to solve problems</p>	<p>Use the metric system to convert units of measure.</p> <p>Round numbers to correct number of significant figures.</p> <p>Determine percentage of error.</p> <p>Understand validity, reliability, accuracy, and precision.</p>
<p><i>Apply</i> scientific method of inquiry</p>	<p>Identify the steps of the scientific method.</p> <p>Conduct experiments.</p> <p>Understand the following terminology: Conclusions vs. inferences Variables Replications Samples/sample size</p>

<p><i>Investigate science history as it applies to industry</i></p>	<p>In groups, research topics in science pertaining to your industry. Have students assign roles for each member of the group. Present findings in report format or in oral presentations.</p> <p>Investigate science ethics.</p> <p>Recognize the processes available for accountability in industry. For example, OSHA has a Safety and Health Program Assessment Worksheet whereby employers can be rated for safety issues. See http://www.osha.gov/SLTC/safetyhealth_ecat/mod3.htm</p> <p>[Note: Safety and Health is a mandatory subject of bargaining when a workplace is unionized; in both unionized and non-unionized workplaces, an employer cannot create and dominate workplace safety committees (see the National Labor Relations Act).]</p>
<p><i>Use scientific instruments to measure aspects of the environment</i></p>	<p>Gather data on time, length, mass, pressure, volume, acceleration, or other measurables using instruments from the job.</p>
<p><i>Demonstrate an understanding of data</i></p>	<p>List the processes involved in gathering data.</p> <p>Suggest ways that data can be grouped or organized.</p> <p>Collect specimens.</p> <p>Show how data can be represented (graphically, charts and diagrams, etc.).</p> <p>Construct a model to depict a basic concept.</p>
<p><i>Identify the seven basic S I (Système International) units</i></p>	<p>Length: meter, m Mass: kilogram, kg Time: second, s Electric current: ampere, A Temperature: Kelvin, K Amount of substance: mole, mol</p>

	Luminous intensity: candela, cd For a dictionary of units, see http://www.ex.ac.uk/cimt/dictunit/dictunit.htm
<i>Identify S I (Système International) Derived units</i>	Choose units appropriate to your industry (hertz, ohm, volt, watt, etc.). Create a picture dictionary demonstrating the concepts.
<i>Review relevant theories, laws, and models</i>	As relating to your industry, discuss important theories, laws, and models.
<i>Use reference tools to solve problems</i>	Use scientific reference tools (such as the Periodic Table of Elements) to learn more about specific industry concepts.
<i>Practice safe lab procedures</i>	Handle equipment with care. Demonstrate safety and first aid procedures. Identify harmful substances.
PHYSICAL SCIENCE	
<i>Understand the cyclical nature of systems</i>	Show, demonstrate, model, track the cycles of any of the following systems: Growth and decay Food webs Weather Water
<i>Analyze/classify matter according to type</i>	Identify types of matter (solids, liquids, gases). Which types are predominantly used in your area of industry?
<i>Explain the concepts of work and power</i>	Identify machines used in industry. Identify how energy levels change when work or power is increased/decreased. Identify fuel sources used in your industry. Discuss internal and external combustion. Create a model demonstrating the uses of levers and pulleys.

<p><i>Be familiar with concepts of motion</i></p>	<p>Measure acceleration and deceleration. Understand the relationship between speed and velocity by performing experiments.</p> <p>Recognize waves and vibrations as a type of motion.</p> <p>Understand action and reaction.</p> <p>Review laws pertaining to motion.</p>
<p><i>Understand concepts related to force</i></p>	<p>Show the need for balance of forces acting on an object.</p> <p>Observe centrifugal and centripetal forces in action.</p> <p>Show how friction is created and must be accounted for in using and preserving equipment.</p> <p>Create a chart showing types of lubricants needed in a factory and schedule of maintenance.</p> <p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of inertia.</p> <p>Show the relationship between pressure, mass, and weight.</p>
<p><i>Understand and apply principles relating to the atom</i></p>	<p>Understand that atoms have a positive, negative, or neutral charge. (Classify protons, electrons, and neutrons.)</p> <p>Identify ions.</p>
<p><i>Investigate forms of and changes in energy</i></p>	<p>Discuss how energy is measured.</p> <p>Observe changes in energy relationships.</p> <p>Identify catalysts and reactants.</p> <p>Identify sources of kinetic and potential energy in your industry.</p>

<p><i>Discuss, apply</i> principles of electricity and electric currents</p>	<p>Identify types of circuits and switches.</p> <p>Show the difference between direct and alternating currents. Give examples of the best/most efficient use of each.</p> <p>Determine how electricity is measured, and solve problems using these terms. (Example, use Ohm's law to calculate current, resistance, and voltage.)</p> <p>Identify good conductors and insulators, and discuss how to choose them.</p> <p>Understand grounding, and create a visual display of grounding safety practices. Include the threat of static electricity.</p> <p>Show the uses of a vacuum tube by building a model.</p> <p>Compare the following ways of generating electricity:</p> <ul style="list-style-type: none"> Hydroelectricity Motors Solar power Steam/nuclear Transformers Incandescent (light) <p>Show the implications for your industry.</p> <p>As appropriate to your industry, identify electrochemical energy sources (cells, electrodes, batteries) and the processes of oxidation and reduction.</p>
<p><i>Be familiar</i> with sound waves</p>	<p>Compare how sound waves travel between liquids, solids, and air.</p> <p>Examine different types (lengths) of sound waves.</p> <p>Examine decibels safe for human hearing.</p> <p>Identify safety precautions for industry regarding sound tolerance.</p>

	<p>Be able to use correctly the terms below as they relate to your industry. For example, ask students to write a short essay explaining a demonstration from class and include the following terms:</p> <p>Amplification Audible range Frequency Acoustics Resonance Speed</p>
<i>Be familiar with principles of heat</i>	<p>Differentiate between the three types of heat transfer (conduction, convection, radiation).</p> <p>Understand that substances expand and contract due to heating and cooling.</p> <p>Identify purpose and types of insulations used.</p> <p>Differentiate between heat and temperature.</p>
<i>Investigate and apply concepts relating to temperature</i>	<p>Use the temperature scales; convert between Celsius and Fahrenheit.</p>
<i>Explain the concepts of magnetism</i>	<p>Understand that currents create magnetic fields.</p> <p>Identify materials that are good conductors and the properties that make them such.</p> <p>Understand electromagnetic forces present in earth.</p>
<i>Investigate/apply chemical properties</i>	<p>Differentiate between acids and bases. Find pH for substances used in industry.</p> <p>Identify substances used in your industry and classify them by type.</p> <p>Name the major drugs, fertilizers, or additives used in your industry.</p> <p>Define and state examples of chemical reactions.</p> <p>Be familiar with solutions used in your industry.</p>

	<p>Compare saturated and unsaturated solutions.</p> <p>Determine whether a solution is soluble or insoluble.</p> <p>Explain solute and solvent.</p>
<i>Investigate forms of and changes in matter</i>	<p>Compare and contrast physical and chemical changes.</p> <p>Discuss the types of physical or chemical changes that take place in your industry from processing raw materials to manufacturing.</p>
<i>Understand and apply concepts relating to the elements</i>	<p>Examine the four elements that make up 99% of living organisms [hydrogen (H), oxygen (O), nitrogen (N), and carbon (C)].</p> <p>Element groups:</p> <ul style="list-style-type: none"> Alkali metals Alkaline earth metals Transition metals Other metals Metalloids Nonmetals Halogens Noble gases Rare earth elements
<i>Be familiar with principles of light</i>	<p>Discuss light as a form of energy.</p> <p>Describe types of lighting systems.</p> <p>Examine the light spectrum and note the relative smallness of visible light.</p> <p>Define reflection and refraction.</p> <p>Explain how light carries information (by lasers), and show examples of the impact on technology/industry.</p> <p>Identify types of lenses.</p>
<i>Be familiar with principles of color</i>	<p>Diagram the main parts of the eye involved in seeing color (rods, cones).</p>

	<p>Use prisms to split light into the visible spectrum.</p> <p>Briefly explore color blindness. What precautions should colorblind people take regarding workplace safety?</p> <p>Define situations in which colorblindness impacts a worker's ability to do his/her job.</p>
LIFE SCIENCE	
<i>Explain the presence of cells as the identifier of all living organisms</i>	<p>Examine the cells of organic material used in your industry, using books, the Internet, or a microscope.</p> <p>Recognize that cells divide or replicate to promote growth of an organism.</p> <p>Examine the parts of a cell. Compare the cell to a machine. How do the parts function and rely on each other?</p> <p>Give examples of one-celled and multiple-celled organisms.</p> <p>Review the classification system of all organisms (kingdom, phylum, etc.).</p> <p>Create a circle graph or pie chart (totaling 100%) showing the relationship (in numbers) between the groups of organisms:</p> <ul style="list-style-type: none"> Bacteria Fungi Viruses Insects Plants Vertebrates Invertebrates <p>Compare some of the cell processes (active and passive transport) with the processes in your industry.</p>
<i>Understand the progress of evolution of organisms</i>	Recognize how a species will adapt to better fit in its environment over time.
<i>Explain the role of genetics in human</i>	Understand, at a level of complexity appropriate

development	<p>to your industry and to students' ability levels, basic principles of heredity, including:</p> <ul style="list-style-type: none"> • Half of an individual's genes are contributed by each parent • Traits that are inherited are either dominant or recessive from the parent(s) • Cell division by mitosis vs. meiosis • Disabilities are caused either by genetic/inherited conditions (such as Down's Syndrome) or in accidents occurring after birth, such as brain damage due to a car accident or a stroke
<i>Investigate/apply</i> principles of human development	<p>Describe the life cycle of humans and other animals.</p> <p>Use the concept of human development to explain the need for understanding foundation skills in your area. (For example, children do not run before they walk.) Use this concept to explain other events that occur in a natural order in your industry.</p>
<i>Explore</i> additional concepts pertaining to humans and other animals	<p>Give examples of ways organisms adapt to their environment.</p> <p>As relating to industry, review the concepts of:</p> <p>Aging Immune system Skin and Tissues Blood and hemoglobin Disease</p>
<i>Compare/contrast</i> the differences between sexual and asexual reproduction	<p>Determine instances when understanding the concepts of sexual reproduction are important for your industry.</p> <p>Highlight the effects of unsafe working practices on unborn fetuses or the dangers present for pregnant women working in industry.</p>
<i>Show</i> a general understanding of the importance of health	<p>Explore the cost of lost wages and worker's compensation in the past year due to health problems.</p>

	Research the most common health problems among workers (workers with safe jobs; workers with most hazards to health, etc.).
<i>Investigate the food cycle</i>	Identify food chains, food webs, food pyramids. Show how changes to the food cycle affect the environment and humans. Name the food groups.
<i>Understand nutrition and the body's need for a diet that provides vitamins and minerals</i>	<p>Show an understanding of body systems (circulatory, nervous, digestive, etc.) as they relate to industry.</p> <p>Identify deficient vitamins and minerals among a particular population (American workers, workers in specific environments, workers who do not go outdoors, or those who always work outdoors) and the health risks associated with job types (office work, mining work, etc.).</p>
<i>Observe health code/sanitation requirements</i>	<p>Research the development of health code and sanitation requirements, including OSHA.</p> <p>Compare/contrast workplaces of 1850, 1900, 1950, and 2000 regarding health and safety.</p> <p>Discuss the most common workplace violations of health requirements and present in a graphic format (e.g., maps, charts).</p> <p>Discuss potential effects of ignoring health requirements.</p> <p>After identifying workplace hazards, create several plans to treat the problem. Debate the benefits of each.</p> <p>To avoid the threat of employers choosing ineffective means of ensuring safety on the job, locate MSDS sheets, first aid stations, personal protective equipment, worker's compensation claims offices/paperwork, etc.</p> <p>Using workplace materials*, locate the section on safety regulations. Ask students to rank the items. Debate the importance of each. Determine the</p>

	<p>threat of ignoring regulations. Research which regulations are often disregarded.</p> <p>Explore proactive measures students can take to extend their health.</p> <p>Understand the importance of mental health in addition to physical health.</p>
<i>Investigate/apply</i> principles of anatomy and physiology	<p>As relating to your industry, explore issues relating to anatomy and physiology.</p> <p>Study the skeletal system--the bones of the arm, hand, and neck. Research carpal-tunnel syndrome.</p> <p>Identify the types of fractures and those most common to your line of work. Learn how to prevent falls.</p>
<i>Understand</i> basic principles of ecology	<p>Define ecology.</p> <p>Identify five major ways in which people interact with the environment, especially as relating to your industry.</p> <p>Discuss the effectiveness of the media as compared with pro-science groups (such as Greenpeace) on the public's awareness of important environmental issues.</p> <p>Identify any areas of concern regarding waste/waste management in your industry.</p> <p>Show the difference between a niche, community, habitat, and ecosystem.</p> <p>Give examples of herbivores, carnivores, and omnivores. How does your industry use and serve each group?</p> <p>Understand predators' effects on food chains. Identify predators of industry.</p> <p>Explain the process of decomposition and decay. How does industry interfere with or interrupt these processes?</p>

<i>State the differences between viruses and bacteria</i>	<p>Define viruses and bacteria. Explore viral and bacterial threats present in the workplace. How can they be prevented? How can they be treated?</p> <p>State the benefits of viruses and bacteria.</p> <p>Explain the recent increased resistance to drugs and antibiotics.</p>
<i>Understand basic concepts relating to plants</i>	<p>Describe the interchange of oxygen and carbon dioxide between plants. Contrast it with the way humans exchange oxygen and carbon dioxide.</p> <p>As relating to industry, review the concepts of:</p> <ul style="list-style-type: none"> Fertilization Parts of a plant and functions of each Effects of temperature on plants Need for water and light Photosynthesis
EARTH SCIENCE	
<i>Recognize earth's position in the universe</i>	<p>As relating to your industry, identify relevant topics regarding:</p> <ul style="list-style-type: none"> Asteroids Comets Stars Galaxies <p>Identify the planets in the solar system. Compare and contrast earth with other planets.</p> <p>Create a model showing the relative size of earth within our solar system. Use mathematical relationships to make sure the scale is correct (earth is the size of ____, so the sun should be the size of ____).</p> <p>How do the phases of the moon and sun affect the hemispheres?</p>
<i>Investigate the history of the earth</i>	<p>Identify geological, chemical, and other methods of determining the age of an object.</p> <p>Demonstrate that fossils and rocks are indicators of previous eras.</p>

	<p>As a class, create a timeline indicating the age of the earth. Include the various ages (Ice Age, etc.) and the length of each. Make sure the timeline is drawn to scale. Assign each age to a group and research the following:</p> <ul style="list-style-type: none"> Weather Major events at beginning and end of age Organisms living during this time Factors that made the age unique
<i>Investigate</i> physical characteristics of the earth	<p>Label/model the components of the earth.</p> <p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of gravity.</p> <p>Solve problems of longitude, latitude, and time zones.</p> <p>Create a model of the ratio of land and water on earth.</p>
<i>Investigate</i> physical forces acting on the earth	<p>Examine erosion and depletion of nonrenewable resources.</p> <p>Identify natural disasters such as hurricanes and earthquakes. Research the effects of a past disaster on a specific industry.</p> <p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of plate tectonics (the earth's surface is broken into large plates; movement of these plates over time causes earthquakes and other geologic activity).</p>
<i>Explain</i> the basic components of earth's rotation	<p>Understand that the earth spins on its axis at an angle of 23 ½ degrees. Identify the period of one complete rotation as a day; longer cycles of rotations identify the seasons.</p> <p>Discuss time zones.</p>
<i>Identify</i> the earth's atmosphere and its components	<p>Identify the main elements in the earth's atmosphere (nitrogen and oxygen).</p> <p>Identify layers of the atmosphere and ozone layer.</p>

	Explain concepts of air pressure.
<i>Understand</i> basic principles of the solar system	Demonstrate how the sun strikes the earth at different angles depending on location.
<i>Demonstrate</i> the relationship between climate and weather	<p>Identify the factors that create weather.</p> <p>Show how landscape features are affected by changes in climate or weather.</p> <p>Identify the greenhouse effect. How does industry contribute to it?</p> <p>Describe the relationship between altitude and weather.</p> <p>Understand that changes in the weather may be seen as fronts that are put in motion by the jet stream.</p> <p>Identify types of precipitation.</p> <p>Differentiate between types of clouds.</p> <p>Understand the effect of winds, wind speeds, and impacts on vegetation.</p>
<i>Learn and apply</i> concepts relating to the oceans	<p>Label the major oceans and seas. Determine the elements in ocean water (nearly all elements are present).</p> <p>Identify or draw the structural components of the ocean floor.</p> <p>Explain the relationship between the moon and the tides.</p> <p>Explore ways the ocean is used for power and business.</p>
<i>Investigate</i> principles of water	<p>Identify the parts of the water cycle and the effects of the processes involved.</p> <p>Define water's chemical properties: Water is the universal solvent Water has a neutral pH of 7 Chemically, water is one atom of oxygen</p>

	<p>bound to two atoms of hydrogen</p> <p>Measure salinity. Which industries rely heavily on water?</p> <p>Define water's physical properties: Water is the only natural substance that exists as solid, liquid, and gas Water's surface has a high density Water has a high tolerance for heat (heat index) Water's weight Water as a coolant Specific gravity</p>
<i>Investigate</i> conservation of physical and natural resources	<p>As relating to your industry, discuss or debate the issues of: Allocation of resources Recovering resources Best/worst methods of using resources</p> <p>Compare/contrast renewable and nonrenewable resources.</p> <p>Note the important developments in your industry regarding mineral, soil, water, and wildlife conservation.</p> <p>Discuss alternative sources of energy as relating to your industry.</p>
<i>Investigate</i> issues regarding scientific technology	<p>As relating to your industry, discuss the uses of technology. What are the newest developments? What effects does the technology have on our society? Political system? Discuss the role of economics on technology.</p>
<i>Apply</i> science principles/laws to environmental issues	<p>Discuss how humankind alters the earth and environment through pollution and the use of resources and technology.</p>

Arkansas' All Aspects of Industry

Defining “All Aspects”

All aspects of an industry include, with respect to a particular industry that a student is preparing to enter, planning, management, finance, technical and production skills, underlying principles of technology, labor and community issues, health and safety, and environmental issues related to that industry. Planning is examined at the level of both an individual business and the overall industry. Planning elements might include:

- Developing strategic plans—mission, vision, goals, objectives, and/or a plan of action
- Working with planning tools such as surveys, market research, and competitive analysis
- Anticipating needs for staffing and major purchases of equipment and supplies
- Developing plans for training and upgrading of staff
- Forecasting market trends
- Developing business plans for entrepreneurial ventures

Management addresses methods typically used to manage enterprises over time within the industry as well as methods for expanding and diversifying workers' tasks and broadening worker involvement in decisions. Key elements of management might include:

- Using an organization chart to explain how a corporate chain of command works
- Providing input for strategic plans and communicating the company's vision and mission statements
- Leading employees in carrying out strategic plans and action plans
- Evaluating employee performance
- Anticipating technology and other major purchasing needs
- Ensuring equity and access for employees
- Resolving conflicts
- Developing job descriptions and written policies/procedures
- Identifying recruitment procedures, training opportunities, methods of evaluation, and retention strategies
- Working with professional associations and community outreach efforts

Finance examines ongoing accounting and financial decisions and different methods for raising capital to start or expand enterprises. Finance functions might include:

- Developing budgets
- Preparing financial statements
- Analyzing and managing financial transactions and records
- Implementing payroll procedures
- Determining and paying taxes
- Identifying indirect wage costs (benefits, FICA, insurance, worker's compensation)
- Making loans and granting credit to customers
- Developing graphs and charts related to company finances
- Identifying and implementing methods of sustaining profitability of a business
- Managing 401K plans
- Identifying sources of capital

Technical and production skills cover specific production techniques and alternative methods for organizing the production work, including methods that diversify and rotate workers' jobs.

Technical and production skills that an employee should have to succeed in a business or industry might include:

- Developing and upgrading job-specific skills
- Using troubleshooting and problem-solving techniques
- Analyzing information to make decisions
- Identifying and implementing quality assurance techniques
- Employing communication skills such as writing, listening, speaking, and reading
- Participating in team efforts
- Implementing projects and new techniques
- Demonstrating basic computer skills; employing time-management techniques in completing projects and assigned tasks
- Demonstrating ethical behavior and work ethic

Underlying principles of technology provide an integrated study across the curriculum of the mathematical, scientific, social, and economic principles that underlie the industry's technology.

Principles of technology that an employee should know might be demonstrated by:

- Exhibiting proficiency in mathematical and scientific functions related to new and emerging technologies
- Continuously upgrading job skills needed to implement new technologies
- Participating in industry certification programs
- Cross-training to enhance one's value to the organization and to enhance job promotion opportunities
- Understanding and adhering to ethical issues related to technologies

Labor issues examine worker rights and responsibilities, labor unions and labor history, and methods for expanding workers' roles. Labor issues might include:

- Understanding and implementing worker rights and responsibilities
- Working with labor unions
- Keeping abreast of local, state, and federal legislation affecting employee and employer rights and responsibilities
- Negotiating and settling worker disputes
- Identifying certification requirements for specific jobs
- Analyzing the impact of labor agreements on business operations

Community issues explore the impact of the industry on the community and the community's impact on and involvement with the industry. Concepts of business and community relations might include:

- Developing and working with community outreach projects
- Participating on advisory committees and community organizations
- Working with professional associations
- Developing and implementing public relations plans
- Participating in community service projects

Health, safety, and environmental issues examine these concepts in relation to both the workers and the larger community. Concepts related to health, safety, and the environment might include:

- Identifying and implementing federal, state, and local regulations related to the health and safety of employees
- Understanding and strictly adhering to federal, state, and local environmental regulations related to the business
- Identifying job-specific health hazards and safety issues
- Identifying and implementing basic safety and first aid training techniques for emergencies such as personal illness or injury, tornadoes, fires, nuclear accidents, floods, and incidences of employee-rage or violent behavior
- Communicating safety regulations and plans to employees
- Working with selected community groups to implement safety programs

Medical Professions Education Framework Cross Reference

Human Anatomy & Physiology

Human Body in Health and Disease

Unit 1	Structure of the Human Body
Unit 2	Integumentary System
Unit 3	Muscular System
Unit 4	Circulatory System
Unit 5	Lymphatic System
Unit 6	Nervous System
Unit 7	Sensory System
Unit 8	Respiratory System
Unit 9	Digestive System
Unit 10	Urinary System
Unit 11	Endocrine System
Unit 12	Reproductive System

Human Anatomy & Physiology

Duty(s): A
Duty(s): B
Duty(s): C
Duty(s): D
Duty(s): E
Duty(s): F
Duty(s): G
Duty(s): H
Duty(s): I
Duty(s): J
Duty(s): K
Duty(s): L